FUT

Active target

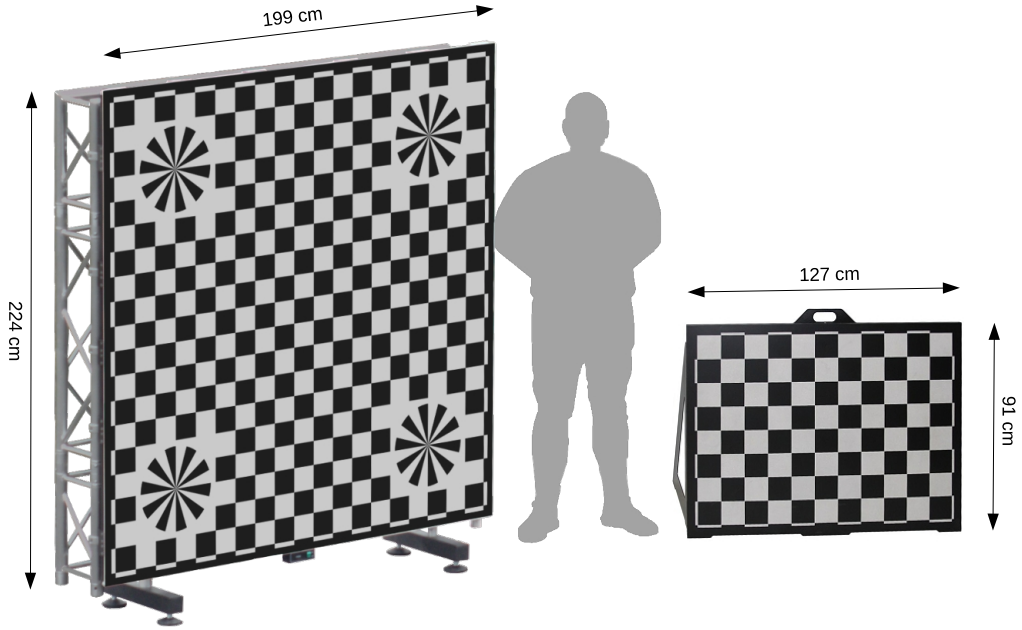


Fig. 1. Photo of exemplary FUT targets (from left customized FUT2020 and standard FUT118)

BASIC INFORMATION:

Targets are modules that can create image of reference patterns needed when testing electro-optical imaging systems. The targets manufactured by Inframet can be divided into two groups: 1)Passive targets, 2)Active targets.
The passive targets need to be irradiated by a uniform beam of light generated by blackbodies or calibrated light sources in order to create images of reference image patterns. These targets are typically small modules of bigger test systems and are located at collimator focal plane. The passive targets do not need electric power for proper work. These are typically small size targets that are used as part of big modular test systems manufactured by Inframet (DT, TAIM, TVT, MS).

The active targets create images of reference image patterns due to their own thermal radiation or due to reflected light emitted by sources typically met in human environment. These targets are typically big stand alone modules (dimensions from 500mm to 3000mm) that need electric power for proper work. Active targets are directly seen by tested EO imagers. These target are popular solution for testing fusion algorithms of fused imagers or as resolution targets of thermal imagers/VIS-NIR cameras. FUT series targets are an example of active targets. They are are often used to test fusion imaging systems or thermal imagers.

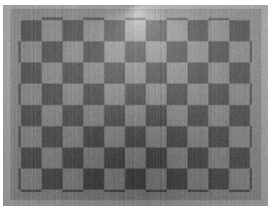
Fusion imaging systems offer increased surveillance capabilities due to fusion of classical thermal image with classical visible image. The fusion systems are typically built using a multi-sensor imaging system composed with a thermal imager and a visible imaging camera (night vision device, visible camera). Fusion of two images can be done using optical method or digital (digital image processing) method.

Generating high resolution fused image is not an easy task due to a series of reasons. Necessity to correct differences in distortion/magnification of images generated by different imaging sensors is one of such reasons. Special targets of well known geometry visible for all imaging sensors are needed for development of image correction algorithms.

The FUT target has been developed to support fusion images from two channels in digital fusion imagers. It is built as a chess board target that emits its own thermal radiation (the target is actually a large area radiation source of regulated uniform temperature) and reflects also incoming radiation in visible/NIR range. Therefore the chess pattern can be seen by both thermal imagers operating in MWIR/LWIR range and by NVDs/cameras operating in visible/NIR range. Then the target can be used for determination of a two dimensional map of spatial displacement of image from thermal imaging channel relative to image from the visible imaging channel.
FUT targets can be also used for testing typical thermal imagers to verify resolution of these imagers.

HOW IR WORKS?

The FUT target is built using a concept of large area, uniform temperature radiation source with surface machined to achieve low emissivity chess-board pattern on high emissivity background. The FUT target is characterized by relative large dimensions that enable to fill completely field of view of narrow FOV fusion imaging system. Single capturing of image of FUT target by thermal imager and by visible/NIR imaging sensor provides data needed for effective image fusion.

a) 

FUT

Active target

It is an uniformly heated target target of typically non regulated maximal temperature. Operation is extremely simple. Just to plug in to the mains and wait for a dozen of minutes to stabilize and FUT is ready to work.

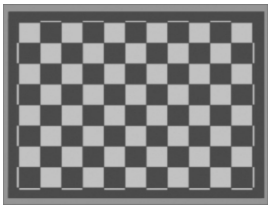
b) 

Fig. 2. Image of FUT target generated by: a) thermal imager, b) visible camera

TEST CAPABILITIES

FUT target can be used to support following tasks:

- Alignment error (angle between optical axis of thermal channel relative to optical axis of visible channel);
- Rotation error (angle between image from thermal channel relative to image from visible channel);
- Two dimensional map of spatial displacement of image from thermal imaging channel relative to image from the visible imaging channel (information how much and in which direction the pixel is displaced comparing to the same pixel in another channel).
- Resolution tests of thermal imagers (custom pattern)

VERSIONS

FUT is offered in form of series of targets of different standard sizes listed below:

- FUT118 of active emitter size 1100×800 mm (11×8 square fields of 100mm size);
- FUT1511 of active emitter size 1500×1100 mm (15×11 square fields of 100mm size);
- FIT2020 of active emitter size 1900×1900 mm (19×19 square fields of 100mm size);
- FUT2216 of active emitter size 2200×1600 mm (22×16 square fields of 100mm size).

However other customized FUT targets are possible to be delivered – customized size and patter.

SPECIFICATIONS

Parameter	**Value**			
	FUT118	**FUT1511**	**FUT2020**	**FUT2216**
Imaging pattern	Chessboard of square patterns (possible customization)			
Size of single square field [mm]	100×100mm (possible customization)			
Size of total pattern field [mm]	1100×800	1500×1100	1900×1900	2200×1600
Reflectance of black fields in visible/NIR range	< 0.3			
Reflectance of white fields in visible/NIR range	> 0.5			
Emissivity of black fields in LWIR/MWIR range	> 0.88			
Emissivity of white fields in LWIR/MWIR range	< 0.5			
Apparent thermal contrast after stabilization period	About +10ºC			
Startup heating time*	Over 15 minutes		Over 45 minutes	
Temporal temperature stability after stabilization	< 1%			
Uncertainty of temperature spatial distribution	0,7 K		2,2 K	
Regulation of maximal thermal contrast	Non regulated (option: regulated)			
Power	AC230/110 V			
Dimensions (WxHxD) [cm]	127×91×73	168×122×93	199×224×50	230×195×50
Mass	30 kg	58 kg	140 kg	145 kg

*Time when FUT target is ready for measurements

**specifications are subject to change without prior notice

Version 3.7

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